(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: 0 341 085 A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 89304592.2

(22) Date of filing: 05.05.89

(51) Int. Cl.[4]: B 63 C 11/20
B 63 C 11/14

(30) Priority: 05.05.88 US 190631

(43) Date of publication of application:
08.11.89 Bulletin 89/45

(84) Designated Contracting States:
DE ES FR GB GR IT NL

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(54) Underwater diving apparatus.

(57) An underwater diving system including a raft (20) configured to support and carry a compressed air tank (34) in such a manner that the raft is extremely stable and is self-bailing and self-righting because of its configuration, a diving harness (70) communicating with the on-board compressed air source so that the diver is tethered and tows the raft underwater at nominal depths up to 20 feet, for example. The diving system described herein bridges the gap that exists between snorkelling and scuba diving.

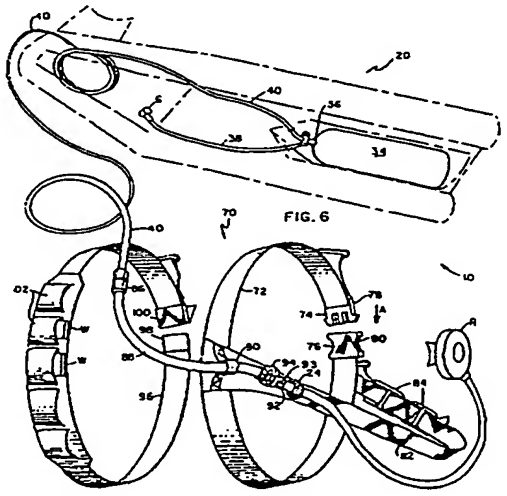

FIG. 6

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diving site. The raft also provides diver transportation to and from the diving site while the diver is supported by the raft. No use of compressed air is needed while relocating to another site. These features add security and safety.

In sum, the instant invention provides substantive benefits derived from scuba diving with the relative freedom and enhanced safety beyond that which is afforded by snorkelling.

OBJECTS OF THE INVENTION

Accordingly, it is a primary object of this invention to provide a new and useful diving apparatus.

It is a further object of this invention to provide apparatus as characterized above which is extremely safe to use, durable in construction and lends itself to mass production techniques.

It is a further object of this invention to provide apparatus as characterized above which combines the benefits of scuba diving with even greater safety than that which is experienced when snorkelling.

A further object of this invention is to provide apparatus as characterized above which includes a harness worn by the diver, a gas line of compressed air attached to the harness and communicating with the diver through a mouth piece, the gas line attached to a source of compressed air carried on a raft, the life line tethered to a raft so that swimming by the diver tows the raft therealong. The raft is configured so as to be self-bailing and includes a sight glass along the bottom wall of the raft to allow the diver to select the most appropriate terrain for exploration.

Viewed from one vantage point it is an object of the present invention to provide apparatus as characterized above which includes a light-weight raft, a source of compressed gas carried on the raft, a gas line from the source to an underwater diver, and a harness connecting an end of the line remote from the source to the diver thereby while the diver explores underwater, the raft is towed along and forces associated with towing are dissipated by the harness. The hydrodynamic shape of the raft and light weight of the inflatable pontoons facilitate this.

Viewed from a second vantage point, the instant invention contemplates as an object the provision of underwater diving apparatus in which a raft formed from a pair of outboard pontoons and interconnected by a membrane defined as a deck, stores a compressed gas container within a compartment on the deck of the raft, such that the compressed gas container depends from the deck, a gas line extends from the container to the diver such that the harness on the diver distributes forces generated while the diver tows the hydrodynamically shaped raft.

Viewed from yet a further vantage point, it is an object of the present invention to provide an underwater diving apparatus in which a raft having a source of compressed gas includes a gas line extending from the source to the diver, the gas line is tethered to a leading portion of the raft and extends down to a harness connected to the gas line and worn by the diver which includes a strap which directs the gas line from the diver's lower back area and over a shoulder to conveniently feed the regulator to the diver's mouth for the admission of air therethrough.

These and other objects will be made manifest when considering the following detailed specification when taken in conjunction with the appended drawing figures.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

Figure 1 is a perspective of a top portion of the raft according to the present invention.

Figure 2 is a top plan view thereof with various compartments exposed for clarity.

Figure 3 is a side view of that which is shown in figures 1 and 2.

Figure 4 is a sectional view taken along lines 4-4 of figure 2.

Figure 5 is a perspective view of a bottom of the raft.

Figure 6 is a bottom view of the raft with the essential diving components shown along with the harness according to the present invention, the raft shown in phantom for purposes of clarity.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings now, wherein like reference numerals refer to like parts throughout the various drawing figures, reference numeral 10 (figure 6) is directed to the underwater diving apparatus according to the present invention. As shown, diving apparatus 10 includes two major components: a raft 20 and a harness 70.

With respect to the raft 20, figures 1-5 detail certain structural components. In its essence, the raft 20 includes two cylindrical pontoons 2 having an upswept "V" shaped nose 4 and a deck 14 extending between the two pontoons defining the raft. This configuration promulgates hydrodynamic efficiency and safety to be described.

More particularly, each cylindrical pontoon 2 includes an end wall 12 at a trailing portion of the raft 20, and each cylindrical pontoon 2 is disposed with respect to the other in spaced parallel configuration. The upswept nose 4 has a substantially V shaped profile when viewed from a top plan view (figure 2) and is formed integrally with the cylindrical pontoons 2. That is, the fabric forming the pontoons and the nose along each side of the raft is cut from a single sheet of material and includes no seam at the intersection or transition 3 between the nose 4 and the pontoon cylindrical portion 2. This transition 3 necessitates very skilful pattern cutting and fabrication because this would be an area of logical stress where the nose sweeps upwardly. Had there been a seam this would be an area of weakness. The stern of the pontoons include circular end walls 12 providing a rearward air barrier. The bow portion of

the raft with greater care thereby providing greater safety for the diver.

Because the air line 40 passes through a velcro strap 24, it can tow the raft 20 as the diver swims below. The lanyard 66 can be used to tow the raft by another vehicle.

With reference to figure 6, the underwater diving apparatus 10 can be explained with respect to the relationship of the raft 20 and the associated harness 70 that the diver wears. As shown, the line 40 extending below the surface of the water communicates with a harness 70 which includes a waist belt 72 that circumscribes the diver. The waist belt 72 includes a girth adjuster 74 so that a free end of the belt can be pulled to accommodate various dimensioned people. The adjuster 72 is integrally formed with a biased catch 78 formed as prongs on opposed sides of the adjuster that fastens to a belt latch 76 carried on a remote extremity of the belt. The belt latch 76 receives the catch 78 by insertion of the catch 78 into the latch 76 according to the direction of the arrow "A" shown in figure 6. The latch 76 has two opposed side walls provided with openings 80 defining a receiver for the catch 78. The openings 80 receive the prongs of the biased catch 78 to hold the waist belt securely. By depressing the prongs of the catch 78 and pulling in a direction opposite from the arrow "A", the belt can be removed quickly.

The harness 70 also includes a shoulder belt 82 extending from a rear portion of the belt 72 and is to be looped over the shoulder of the wearer and is fastened to a forward portion of the belt near the belt latch 76. The shoulder strap 82 is provided with a strap adjuster 84 to vary the length of the shoulder strap to accommodate people of different dimensions.

Since the air line 40 is to communicate with a mouth piece regulator "R" for the diver and because the air line 40 is to tow the raft 20, the harness is constructed to support the air line in such a manner that the forces associated with towing the raft are not encountered by the mouth area of the diver but instead are dissipated along the person's body to make the tether to the raft hardly discernible. The air line 40 couples to a harness section of the air line 88 through a quick disconnect coupling 86 for safety. The harness air line 88 is first tethered to the shoulder strap 82 near where the shoulder strap joins the waist belt 72 at a lower back area of the diver. This back area is shown in figure 6 as being a portion opposite from the latch 76 and catch 78. A loop 90 supports the weight and forces exerted by the raft on the diver. In addition, a velcro strap 24 is provided up from the belt area on the shoulder strap 82 and tethers the harness air line 88. Interposed between the velcro strap 24 and the loop 90 is a chafe liner 92 configured as a rubber sleeve having a longitudinal slit 93 overlying the harness air line 88. Circumscribing the chafe liner 92 is a clamp 94 radially constructing the chafe line R 92. Thus, the clamp 94 and the chafe liner 92 provide limits in harness air line 88 motion between loop 90 and velcro 24 as a safety feature. An alternative would be to attach clamp 94 directly to line 88 and contrain axial movement via annular stops on either side of the clamp 94.

Assume that the line 40 is snagged in some manner. The presence of the clamp 94 assures that the regulator "R" will not be pulled from the mouth of the diver. This gives the diver sufficient time to explore the nature of the snag and take appropriate action. Since the air line 40 is contemplated as having a maximum length of approximately 20 feet, the diver has several options available. The diver can either unsnag the line, disconnect coupling 86 or release the harness and surface safely. Note further coupling 86 on the nose portion (FIG 2). This coupling allows a snagged line to be dropped if necessary. This coupling also allows two diving lines to be used if the coupling includes a "Y" adapter (line bigurcation). This apparatus would be helpful when training a diver, rescue operation, etc. Clearly, more than two lines could be provided if desired.

As an additional safety feature, it is proposed that a weight belt not be integrally formed with the harness. As shown in figure 6, a weight belt 96 having a free end 98 connects to a buckle 100 that includes a girth adjustment not too dissimilar from an auto seat belt. The weight belt 96 includes a plurality of weight pockets 102 within which weights "W" are carried. Removal allows the diver to proceed to the surface effortlessly.

In use and operation, the diver paddles to an appropriate area for underwater exploration as determined through the viewing window 48, checks that the tank has sufficient air through the gauge "G", dons the harness and weight belt, uses the air line 40 and proceeds to explore below the water with the raft following the diver as described. Moreover, having thus described the invention, it should be apparent that numerous structural modifications and adaptations may be resorted to without departing from the scope of the invention as defined hereinbelow in the claims.

Claims

1. Underwater diving apparatus, comprising:
a lightweight raft;
a source of compressed gas carried on the raft;
a gas line from the source to an underwater diver; and
harness means connecting an end of the line, remote from the source, to the diver,
wherein, while the diver is underwater, the raft is towed along and forces associated with such towing are dissipated by the harness.

2. Apparatus according to claim 1, wherein the raft includes a compartment within which the compressed gas source is disposed and which is in depending relationship with respect to a deck area of the raft, whereby the weight of the compressed gas source lowers the centre of gravity of the raft and enhances the raft's ability to resist capsizing and promulgates self-righting.

3. Apparatus according to claim 2, wherein a trailing portion of the raft is open ended and the

15. Apparatus according to claim 14, wherein a trailing portion of the raft is open ended and the compartment is disposed adjacent thereto, thereby adjusting the trim of the raft and providing a self-bailing raft.

16. Apparatus according to claim 15, wherein the compartment has a recessed configuration complementary with an external configuration of the compressed gas source,
a cover seals access to the compartment, and
the source includes first and second lines extending therefrom under the raft and entering a nose portion of the raft through the deck, thereby providing a diver occupant area unobstructed by hose lines.

17. Apparatus according to claim 16, wherein the nose portion includes an area for receiving a length of line communicating with the compressed air source,
a cover overlies the air line area and includes an arcuate opening adjacent the nose of the raft to allow the line to pass therethrough and thence downwardly into the water, and
the nose portion further includes a sight window to allow the diver a view of the underlying underwater terrain.

18. Apparatus according to claim 17, wherein the raft is formed from first and second pontoons having a rear portion of substantially elongate cylindrical dimension,
a nose portion is angled upwardly and inwardly to form a substantially "V" shaped nose,
the deck includes a plurality of inflated passageways interrupted by a pattern of pressed seams, thereby minimizing any formation of a central crown with respect to the deck,
a pillow is interposed between the sight glass and the seam pressed areas for providing support of the diver when viewing through the sight glass, and
said harness means includes first and second loops adjacent a lower back area of the diver for directing said air line over a shoulder of the diver and providing resistance to a tendency for removal of a regulator from a mouth of the diver at a terminal portion of the air line, should the air line encounter a snag.

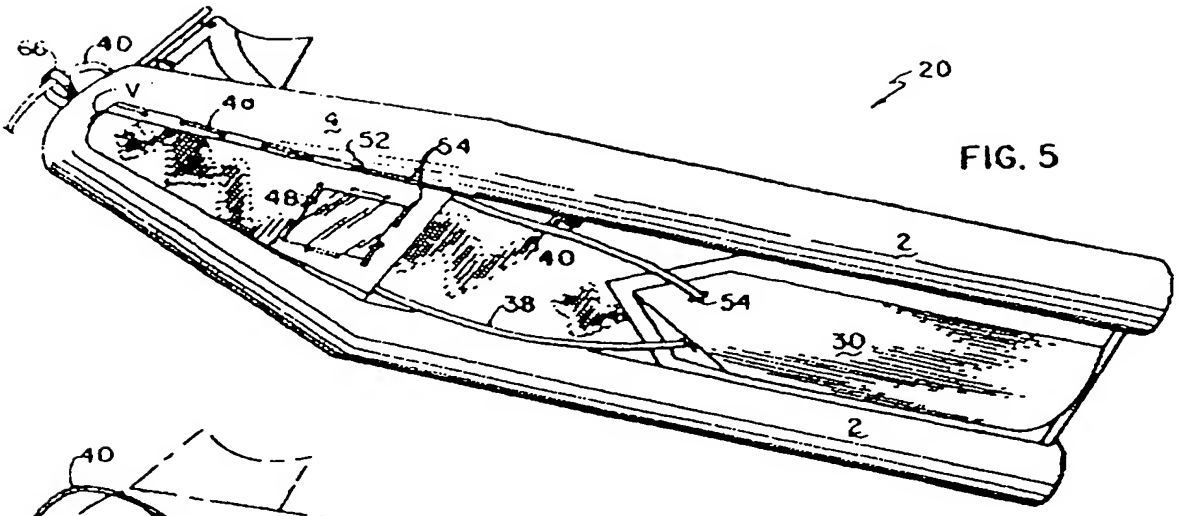
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FIG. 5

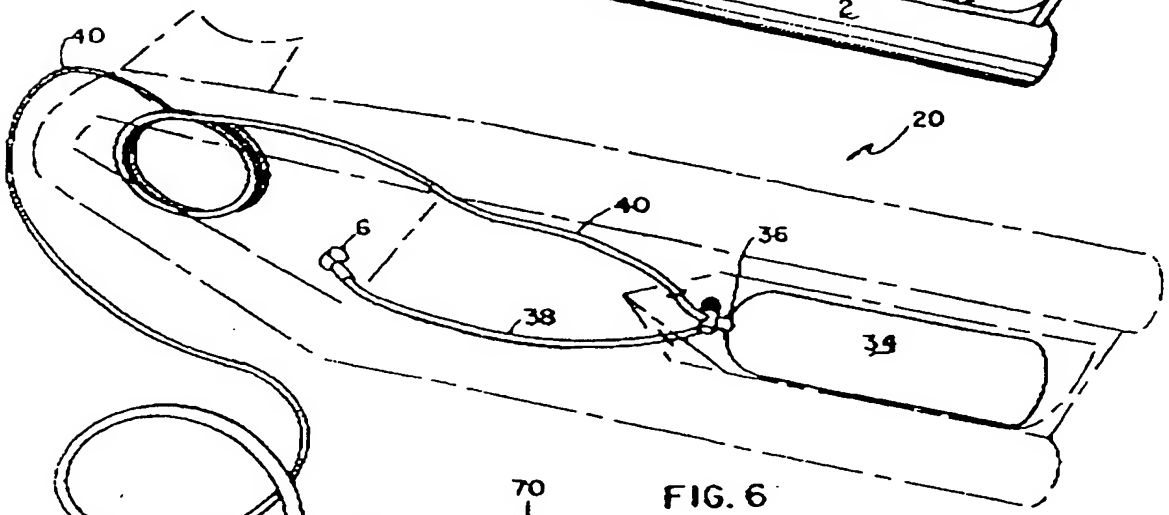
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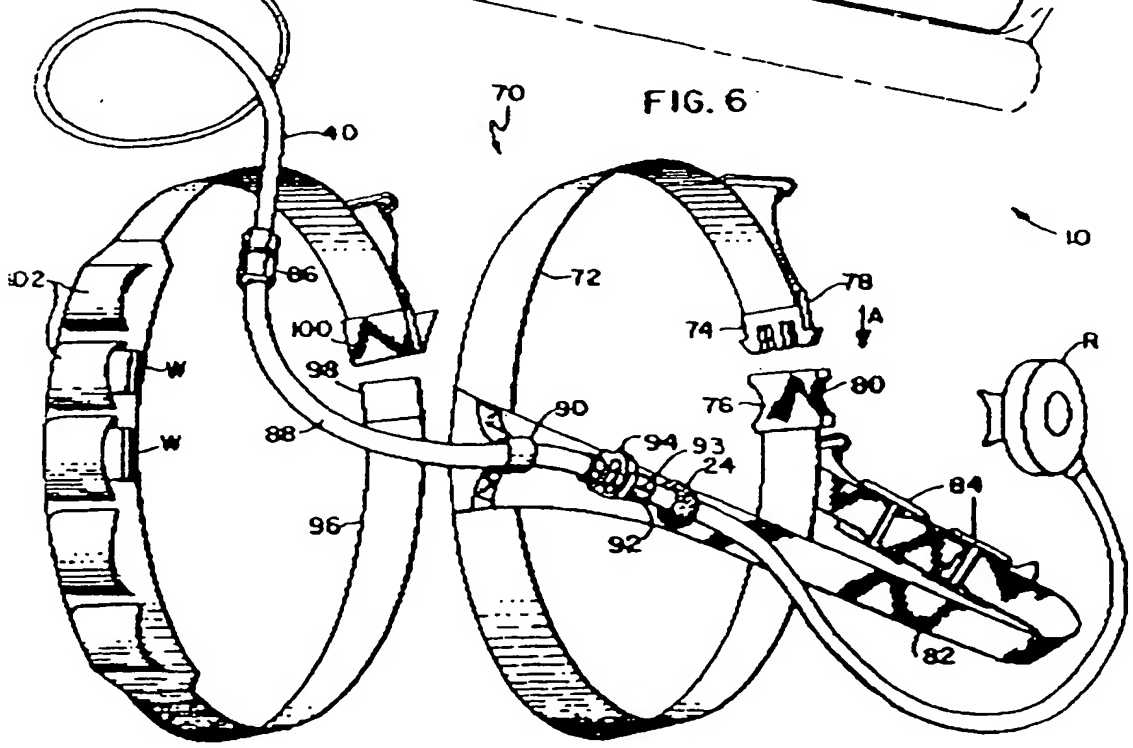
FIG. 6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